NOVELTIES IN DERMATOLOGY

Use of www.dermatoweb.net to Support Undergraduate Teaching of Dermatology

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Abstract. Dermatoweb is a website to aid undergraduate dermatology training. It includes the dermatology program of the Lerida Faculty of Medicine, and is based principally on clinical presentations, tables with the differential diagnosis of the 20 most common reasons for dermatologic consultation, about 200 clinical test cases to stimulate self-training, and a subject list with the 32 topics that make up the dermatology syllabus in many faculties of medicine. Thanks to this website, some of our students achieve high marks in dermatology despite hardly coming to classes. In addition, therapeutic guidelines for the common dermatoses can be found on the site, and an atlas with more than 5,300 photographs and almost 100 videos on the more common dermatological procedures; these can serve as a visual aid for family doctors, residents in dermatology in the initial years, and practicing dermatologists.

Key words: dermatoweb, computer-based learning, undergraduate

WWW.DERMATOWEB.NET. UNA WEB DOCENTE PARA EL APRENDIZAJE DE LA DERMATOLOGÍA EN EL PREGRADO

Resumen. Dermatoweb es una web de ayuda para el aprendizaje de la Dermatología durante el pregrado. Contiene el programa de la asignatura de la Facultad de Medicina de Lleida, basado principalmente en presentaciones clínicas, unas tablas con el diagnóstico diferencial de los 20 motivos de consulta más frecuentes en Dermatología, unos 200 casos clínicos problema, para estimular el autoaprendizaje, y un temario con los 32 temas que conforman el programa de Dermatología de muchas de las facultades de Medicina. Gracias a la web algunos de nuestros estudiantes superan la asignatura de forma notable sin apenas haber venido a clase. Contiene además unas guías terapéuticas de las dermatosis comunes, un atlas con más de 5.300 fotografías y cerca de 100 vídeos referentes a los procedimientos dermatológicos más empleados que pueden servir de ayuda para el médico de familia, los residentes de Dermatología de los primeros años y el dermatólogo práctico.

Palabras clave: dermatoweb, aprendizaje por ordenador, pregrado.

Introduction

Although dermatosis is one of the most common presenting complaints in primary care (between 7% and 10.2% depending on the series)[1-4] and approximately 50% of new graduates will go on to become family doctors, students first come into contact with dermatology during the latter part of their degree. They have never heard of papules, impetigo, pemphigus, or lichen planus, although they know through "common knowledge" what psoriasis, melanoma, and tinea are. Furthermore, in Spain and in neighboring countries, dermatology is one of those specialties that have fewer and fewer credits in study programs.[5] In the United States, students receive, on average, less than 18 hours of teaching during their degree.[6] In Spain, the mean is 3.4 theory credits—ranging from 2.7 at the Autonomous University of Barcelona to 4.7 at the University of Seville (survey carried out among dermatology lecturers at 19 Spanish teaching hospitals; data not published but presented at the meeting of the

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Lecturers and Teachers Group of the Spanish Academy of Dermatology and Venereology at its National Conference in Barcelona, 2008)—and 1.2 practice credits. At the same time, the number of students is increasing and clinical experience is now concentrated among a small number of busy lecturers.

Many experts in medical education recommend that medical faculties follow the principles of adult education by placing students in real-life situations that awaken their curiosity and stimulate learning,[7-10] in a process known as self-directed learning or "self-training." Adults study what is necessary for their day-to-day activity, and are reluctant to learn material that is forced upon them.[11,12] The experts also recommend introducing new technology for learning,[13] such as work in a skills laboratory[14] or e-learning, which overcomes problems of geographic distance and timetable restrictions.[15,16] E-learning programs are increasingly used in medical education, and there are many examples in areas such as cardiology,[17-19] radiology,[20] urology,[21,22] and surgery.[23] E-learning is also being used in dermatology. In many cases, the approach involves interactive learning programs, such as the National Education Program in Dermatology and Venereology of the University of Karolinska, which uses simulated clinical cases where the student outlines the questions to be asked when taking a history, suggests appropriate laboratory tests, and offers a diagnosis, a differential diagnosis, and information on further management.[24] An interactive approach can also be seen in the e-learning package used by the University of Manchester for teaching skin examination,[25] or that of the Charité University in Berlin, Dermatological Education as Joint Accomplishment of Virtual Universities, which includes classes, case reports, and structured learning modules.[26]

The effectiveness of e-learning has been compared with that of traditional teaching, and no significant differences have been detected,[24] although in some cases students who had used e-learning obtained slightly higher results (16.14 and 14.89 correctly answered questions).[27] In the field of skin cancer, students who had followed the e-learning course achieved significantly better results than those who took traditional classes.[28]

In Spain, the University of Valencia has developed an excellent website (www.uv.es/derma) to support undergraduate teaching of dermatology. At the University of Lleida, we are working with dermatoweb (www.dermatoweb.net), a website with similar characteristics that contains the course program, the differential diagnosis for the 20 most common presenting complaints in dermatology, a subject list, an atlas with more than 5300 photographs, interactive case reports, therapeutic guidelines, and almost 100 videos on the most common dermatologic procedures for the diagnosis and treatment of skin diseases.

Sections of dermatoweb

"Topic." The Dermatology Program of the University of Lleida

Most medical faculty study programs are content-based. They depend on the textbooks used in the specialty and on the lecturer's preference. In 1993, the General Medical Council of the United Kingdom recommended that study programs define a core curriculum, which would include the know-how, skills, and approaches required by a medical graduate.[8] Today, these are known as competencies.

One of the best methods for preparing a training program is the Delphi technique,[29-32] which involves presenting a questionnaire on training requirements to a panel of experts. The least important replies are eliminated, and consensus is achieved through a series of rounds. This was the approach adopted to develop the undergraduate program of the University of Manchester in 1999,[33] the dermatology program for the same year—drawn up by a group of lecturers from the British Association of University Teachers of Dermatology[34]—and the 2006 dermatology program in the United Kingdom, with the consensus of a multidisciplinary group comprising dermatology lecturers, family doctors, physicians from other specialties, nurses, and pharmacists. After 3 rounds of questions, 53 objectives were deemed very important by more than 60% of the participants; therefore, the parties concluded that these objectives should go to make up the core curriculum.[35]

Another approach to defining competencies in medicine involves epidemiology studies (prevalence and morbidity and mortality[36]), since the sum of both make learning relevant. These help to establish priorities and to adapt the time devoted to teaching how to tackle and resolve specific health problems, thus avoiding the tendency of some lecturers to give priority to teaching areas of personal interest. We chose this method to develop the dermatology curriculum of the University of Lleida. Our aim was to base the core content on the most common presenting complaints in our setting. Therefore, for 1 year, we recorded the reasons for referral from primary care centers. The "20 Most Common Presenting Complaints in Dermatology" thus became the basis of our curriculum. In classes composed of large groups, we select a noteworthy case for each of the 20 complaints,[37] and this is presented as a summarized clinical history for which a differential diagnosis is discussed.

The other objectives we set were that the program should stimulate self-training and allow students to build on basic topics before taking on more difficult areas. Self-training is encouraged by providing students with 2 problem reports related to the case under discussion

for which the issues are presented as learning objectives. Students prepare the case reports and discuss them in small groups during the following days. Basic science topics are taught by lecturers in the corresponding subjects the day after the cases are chosen and are directly related to the cases, eg, pathophysiology of pruritus, skin adhesion molecules, pathophysiology of urticaria, allergic contact dermatitis, or vasculitis. The syllabus is completed with 2 topics on skin signs (basic lesions and regional dermatology), 4 topics on the cutaneous manifestations of general diseases (genodermatosis, collagenosis, lymphoma, and systemic conditions), 4 topics on dermatopathology (basic dermatopathology, dermatopathology of blistering diseases, dermatopathology of inflammatory diseases, and dermatopathology of tumors), and carcinogenesis (Table).

The 20 Most Common Presenting Complaints in Dermatology

This is the core of the program. It is composed of 20 clinical pictures that reflect the most common reasons for referral from primary care. The skin complaints giving rise to the condition are set out in columns, and each column provides a summary of the etiology, clinical characteristics, and treatment. The page "Generalized Pruritus With No Evident Dermatosis" (*Prurito sin dermatosis evidente*) (Figure 1) includes "Scabies" (*Sarna*), "Pruritus Without Skin Lesions" (*Prurito sine materiae*) and its variants ("Neurotic Excoriations" [*Excoriaciones neuróticas*] and "Prurigo Nodularis" [*Prurigo nodular*]), atopic dermatitis, and herpetiform dermatitis. The page "Bald Patches" includes alopecia areata, scarring alopecia, tinea tonsurans, kerion, trichotillomania, and tinea amiantacea. Pigmented lesions include common and atypical melanocytic nevi, melanoma, pigmented basal cell carcinoma, and seborrheic keratosis. A good knowledge of these pictures goes a long way toward helping students with the answers in the practical examination. They are also frequently useful for professionals in clinical practice.

Seminars

Seminars include the classic syllabus of the specialty, which is formed by the 32 topics that make up the dermatology program in many Spanish medical faculties and which, in our case, complement the case reports. The syllabus was drawn up by some 20 lecturers from several Spanish medical faculties. Each of the topics covers between 4 and 6 case reports with multiple-choice questions and answers with comments that serve as a means of self-appraisal.

Case Reports

Self-training is nurtured by means of around 200 case reports. Some require short answers, depending on the training objectives. Students prepare them in writing for the small group sessions. Case reports are the practical part of the subject, which is complemented by a week-long stay at a dermatology clinic with a specific training program. Unfortunately, clinical practice sessions are voluntary, given the large number of students. Solving these cases makes the practical examination much easier. There are also case reports with 3 or 4 multiple-choice questions and answers with comments (Figure 2).

The Atlas

Dermatoweb has an atlas with more than 5300 high-quality photographs that represent the majority of common and less common dermatoses and skin tumors. The dermatoses are classified alphabetically, as in most atlases available on the Internet. Each dermatosis is represented by 1 or more pages of 20 thumbnails measuring 120 × 90 pixels. The atlas also serves as a source of information for the other sections of the website (eg, "The 20 Most Common Presenting Complaints in Dermatology," "Case Reports"). In all the sections, the images can be enlarged to 600 × 450 kb. It is one of the most complete atlases in Spanish and, for some years now, has been among the first 5 hits on Google when the section titles are used as search strings. Students find it particularly useful for the practical examination, which involves case reports. Some have even revised the whole atlas before taking the exam. As dermatology is based on images, having so many available also makes it easier for the practicing physician and the medical resident to diagnose dermatoses through comparison.

Other high-quality atlases available on Internet include DOIA and PeDOIA from the universities of Heidelberg and Erlangen in Germany,[38] both of which are available from http://dermis.multimedica.de/dermisroot/en/home/index.htm, and the so-called Dermatlas of the Johns Hopkins University, available from http://dermatlas.med.jhmi.edu/derm/

Therapy Protocols

Dermatoweb also contains guidelines on the most widely accepted dermatologic treatments for common dermatoses. Whenever possible, these are evidence-based. The guidelines open with an introductory section on the principles of topical therapy and some basic notions on extemporaneous formulation. For some time now, a Google search with the search string "Bases para el tratamiento dermatológico" (that is, "Basis of Dermatologic

Table. Dermatology Curriculum of the University of Lleida Faculty of Medicine

Topic 1. Histology of healthy skin (integrated)
Topic 2. Functions of the skin (integrated)
Topic 3. Basis of diagnosis (I)
Topic 4. Basis of diagnosis (II)
Topic 5. Basic dermatology (integrated)
Case 1. Patient aged 26 with generalized pruritus (clinical presentation)
Topic 6. Pathophysiology of pruritus (integrated)
Case 2. Patient aged 27 with clustered vesicular lesions (clinical presentation)
Case 3. Child aged 2 with acute-onset generalized erosions and blistering (clinical presentation)
Case 4. Patient aged 69 with generalized blistering (clinical presentation)
Topic 7. Mechanisms of skin adhesion and pathogenesis of chronic blistering diseases (integrated)
Case 5. Patient aged 18 with facial pustules (clinical presentation)
Topic 8. Dermatopathology of vesiculobullous and pustular dermatoses (integrated)
Case 6. Patient aged 43 with erythematous desquamative plaques on the trunk and extremities (clinical presentation)
Topic 9. Fungal infections (integrated)
Case 7. Baby aged 6 months with facial erythematous plaques (clinical presentation)
Case 8. Patient aged 53 with inguinal erythematous plaque (clinical presentation)
Case 9. Patient aged 57 with erythematous plaques on the hands (clinical presentation)
Topic 10. Pathogenesis of eczema: atopic dermatitis and allergic contact dermatitis (integrated)
Case 10. Patient aged 23 with erythematous desquamative papules on the trunk (clinical presentation)
Case 11. Patient aged 49 with generalized evanescent lesions (clinical presentation)
Topic 11. Pathogenesis of urticaria and vasculitis (integrated)
Topic 12. Dermatopathology of inflammatory dermatosis (integrated)
Case 12. Patient aged 34 with depigmented perioral patches (clinical presentation)
Case 13. Patient aged 19 with a painful lesion on the plantar surface of the foot (clinical presentation)
Topic 13. Infection by papovavirus and by poxvirus (integrated)
Case 14. Patient aged 17 with bald patches (clinical presentation)
Case 15. Patient aged 29 with desquamation and pruritus on the scalp (clinical presentation)
Case 16. Patient aged 29 with genital ulcer (clinical presentation)
Case 17. Patient aged 66 with a skin-colored tumor on the face (clinical presentation)
Topic 14. Carcinogenesis caused by UV rays. Oncogenes (integrated)
Case 18. Patient aged 73 with facial keratotic papules (clinical presentation)
Case 19. Patient aged 44 with pigmented lesion on the chest (clinical presentation)
Topic 15. Dermatopathology of tumors (integrated)
Topic 16. Cutaneous manifestations of internal diseases (I). Collagenosis
Topic 17. Cutaneous manifestations of internal diseases (II). Genodermatosis
Topic 18. Cutaneous manifestations of internal diseases (III). Leukemia and lymphoma
Topic 19. Cutaneous manifestations of internal diseases (IV). Miscellaneous

Treatment") returns the website among the first 5 hits. The "Therapeutic Protocols" section (Protocolos terapéuticos) has proved most useful during the first years of the dermatology residency, for the practicing dermatologist, and for primary care physicians (Figure 3).

Video Recordings of Dermatologic Procedures

In recent years, we have introduced some 100 videos on common dermatologic procedures (cryotherapy,

Figure 1. Pruritus with no patent dermatosis. First differential diagnosis table in "The 20 Most Common Presenting Complaints in Dermatology."

electrocautery, curettage) and dermatologic surgery (wedges, flaps, and grafts), with particular emphasis on the face, classified by anatomical region. We believe that this section is one of the most popular on the website. The procedure is sometimes explained with the help of a text and, occasionally, in the form of a schematic diagram with illustrations.

Comment

Almost 40 years ago, Sneddon[39] postulated that medical graduates should be able to examine the skin and record the findings in the medical history, gain a reasonable knowledge of common dermatoses (acne, eczema, psoriasis, and infections), and know when to refer a patient to the dermatologist. Today, we could add that they should learn to differentiate between the different tumors—particularly nevus, carcinoma, and melanoma—and to recognize the cutaneous signs of some specific systemic conditions.

Most experts feel that, in order to learn dermatology, the student must observe several cases and classify them by patterns. Recognition of patterns is developed through constant repetition. This almost subconscious process consisting of comparing cases by appearance is more effective with real patients, although observation of multiple images is almost as useful. Recognition improves if the image is complemented with theoretical data,[40,41] thus enabling the student to retain the pertinent clinical information in a specific case, the key characteristics, and the outcome. This is gradually stored in the student's memory and, with experience, makes for rapid, effective, and accurate recognition.[42-44] Accuracy increases as the patient becomes more adept at taking a history and performing a thorough examination of the skin, which often includes palpation.

At the University of Lleida, we began to use multimedia to teach dermatology in 1997, with a CD-ROM containing case reports of the most common and severe conditions. This

Figure 2. Case reports: multiple-choice questions. Case 4 of the topic "Viral Infections."

was used for the small group sessions. In 1999, we added the basic syllabus of the specialty, an 800-photograph atlas, and approximately 100 interactive clinical cases with multiple-choice questions and a reasoned answer. In 2001, we included the differential diagnosis of the 20 most common presenting complaints and therapy guidelines for the most frequent dermatoses. The atlas was extended to include some 3000 photographs. This content was uploaded to the website (www.dermatoweb.net). In 2004, the site was redesigned and, since 2006, has included about 100 videos on diagnostic and therapeutic techniques such as local anesthesia, biopsy sampling, sample collection for potassium hydroxide staining, cryotherapy, curettage, electrocautery, and different types of excision.

Dermatoweb acts as an aid to self-training and as a means of reinforcing the study program. Our aim is not to replace clinical training with patients, as e-learning cannot provide information on the feel of a skin surface or the consistency of a lesion. Neither does it give a clear idea of the extension of a rash. However, it does offer a large array of images and enables the student to study and learn at any time of the day. On-line training is of little help when teaching the skills used to deal with patients, such as empathy and knowing what to ask and asking it. Nevertheless, we have observed that, since the inclusion of clinical presentations in the study program, sixth-year students who are on rotation can make a differential diagnosis more easily than before.

Dermatoweb is the product of many hours of work and of the teaching experience of those who created it. A survey of students in 2006-2007 revealed that the website was considered very useful (56% reported having

Figure 3. Therapy protocols. Treatment guidelines for impetigo.

consulted dermatoweb 3 or more times per week during their studies, and only 5% said they had never consulted it). It scored 4.4 out of 5 in a sample of 63 students, the favorite areas being "The 20 Most Common Presenting Complaints in Dermatology" (4.53), the atlas (4.48), and the problem case reports (4.14). For 56 students, dermatoweb was their only study resource and only 7 used books (unpublished data presented at the National Dermatology Conference in Granada, 2007). Repetition of several images and recognition of patterns (simplified in "The 20 Most Common Presenting Complaints in Dermatology") enables students to establish a differential diagnosis and propose appropriate treatment in problem cases. Those who benefit most are the students who regularly attend class and the small group sessions. However, almost every year, some students manage to pass

the dermatology course with good grades despite hardly having come to class.

All the sections in dermatoweb are interconnected in such a way that the syllabus can be consulted from "The 20 Most Common Presenting Complaints in Dermatology", and users can be directed to the therapy protocols, videos, and atlas with a single click of the mouse. Next year we hope to introduce an elementary dermatoscopy atlas.

Another website, www.derm101.com, teaches dermatology and dermatopathology using an approach that is similar to ours. It contains a clinical atlas of the 101 most common dermatoses, with more than 3000 photographs, 200 of which are of histopathologic images, and a text on the pathogenesis and clinical characteristics of the dermatoses. Another section presents the key to the diagnosis and the differential diagnosis in

dermatopathology, therapeutic resources, and a selection of interactive questions.[45]

Over the last 20 years, e-learning has been gaining acceptance as a means of studying medicine in general and dermatology in particular. The advantages of this approach are the availability of study material at a time and place that are convenient for the student, its interactivity (which acts a stimulus to active learning), the freedom to review study material as often as necessary, and the presentation of knowledge in the same way that will be used when working as a physician. Another advantage it offers in our specialty, a predominantly visual discipline, is that students have access to a substantial number of high-quality images on the website.[28]

When the e-learning system was first implemented in 1997, only 30% of students had a computer, and they complained that they could only solve problem case reports in the faculty computer suite. Today, 100% of students have a computer, they are accustomed to using the Internet to obtain biomedical information, and consider e-learning a useful and effective approach to studying dermatology.[48]

Nevertheless, one of the differences between medicine and other university courses is that complex knowledge is acquired through practice. Contact with patients is essential in order to take a clinical history, explain therapy, and develop communication skills and empathy.[16] Bedside learning is the most consistent approach of all, although it requires considerable use of human resources. Dermatology is really learned through practical clinical training during the fifth year and while on rotation, when students develop their clinical skills under the supervision of an expert.[49,50] E-learning is unlikely to replace contact with patients in the acquisition of these skills.

Finally, training in dermatology should be planned as a continuum that starts during the undergraduate phase, with clear basic clinical and physiologic objectives. Family doctors and their residents should continue this training, with the aim of treating common dermatoses and knowing when to refer a patient to the dermatologist. At a more complex level, training for dermatology residents should have wide-ranging medical-surgical objectives that will provide them with a portfolio of skills. Continuing education should enable these skills to be consolidated. Such a system can only be achieved through coordination between the parties involved: university lecturers, professionals who train family doctors, dermatology residents' tutors, and experts in continuing medical education, all within the framework of a university hospital. E-learning has a clear role to play in the contribution of each of these parties. Those who defend traditional teaching methods are reluctant to adopt new technology. However, if we bear in mind the steady increase forecast in the number of undergraduates in Spain with the opening of new faculties, together with the shortage of dermatologists, lecturers, and tutors, this technology can ensure the availability of study material for dermatology students.

Acknowledgments

Conflict of Interest
The authors declare no conflicts of interest.

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